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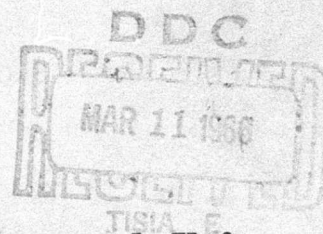
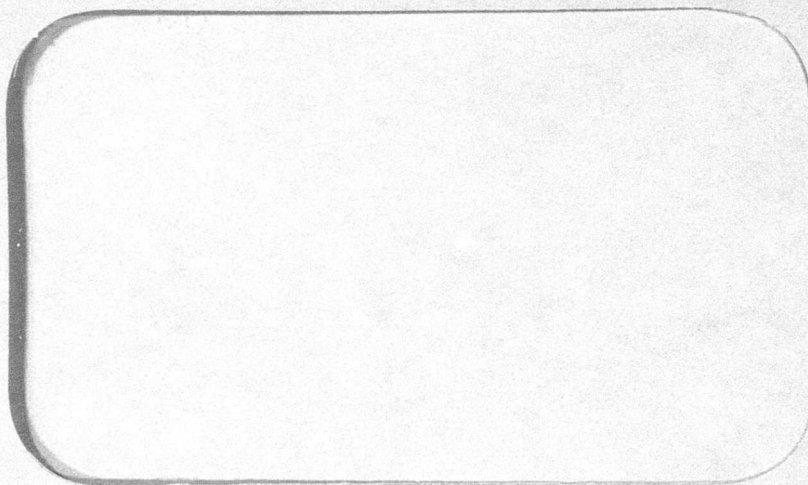
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U.S. Army Leadership Human Research Unit
Presidio of Monterey, California

Under the Technical Supervision of

The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
operating under contract with
THE DEPARTMENT OF THE ARMY

Task ENDORSE

Research Memorandum

PROGRESS REPORT ON STUDIES OF
SENSORY DEPRIVATION

by


Thomas I. Myers, Donald B. Murphy, and Seward Smith

Based on a Task ENDORSE briefing to
Assistant Chief of Staff, Intelligence,
Department of the Army, July 1960

Approved:



Howard H. McFann
Director of Research



Luther L. Sexton
Lt. Col., Infantry
Chief

U.S. Army Leadership Human Research Unit
Presidio of Monterey, California
March 1961

Composition of Research Team

Dr. Thomas I. Myers has been the Task leader since the inception of Task ENDORSE. Dr. Donald B. Murphy has been a senior staff member since October 1957, with especial responsibility in clinical psychology aspects. Dr. Seward Smith joined the staff in June 1959 as an experimental psychologist, with especial responsibility in instrumentation and equipment development.

Many of the research assistants—14 out of a total of 18 during the period covered by this report—have been young psychology trainees serving a tour of Army duty. During the planning and pilot study phase, assistance was given by SP 3 Lyman M. Forbes in instrumentation, measurement, and general experimental procedure; by Pfc Jack A. Arbit, especially in connection with research literature; and by Mr. Jack Hicks and SP 4 Gerald Burday in social psychological aspects of the work. During the planning of new laboratory facilities and the developing and pretesting of measures and techniques to be used in it, developmental studies were conducted by SP 4 Edward Kandel, SP 5 Robert D. McDonald, and, especially, SP 5 Richard A. Monty. During the laboratory studies, SP 4 Kenneth A. Anderson, SP 4 Clifford D. Jones, Jr., and SP 4 Philip K. Berger assisted in monitoring the safety of the cubicle subjects, SP 4 Eldon L. Husted assisted in various elements of the program, SP 4 Robert E. Thayer was particularly concerned with the personality assessment of the subjects, and Mr. Marshall Smith was active in administration and management. In the present group of research assistants, Mr. Donald F. Terry has dealt especially with interview and questionnaire construction and analysis, Pfc George L. Hampton has assisted in many aspects of the study, Pfc Paul Haas has designed and built data collection and reduction devices, Pfc Joe Perry has served as electrical engineer, and Mr. Gordon Gay has contributed mechanical designs.

In the key role of administrative NCO was SFC Andrew C. Armstrong, who arranged for selection, transportation, feeding, and housing of the troops assigned as subjects, and supervised the other NCO's on the Task. SFC Ernest Barnes, SFC Bernard L. Lemen, and MSgt Thomas D. Honeycutt have served as leaders of research subjects in the billeting areas assigned by the Army Language School and have assisted in standardizing their activities, and SFC Eduardo C. Gomez and SFC John H. DeAnzo have monitored the safety of cubicle subjects.

Dr. Herman Medwin served as a consultant, designing the construction to provide the desired acoustics for the unique laboratory provided by the Army for the Task ENDORSE studies.

Since the Task beginning, military counsel and guidance have been provided by former Unit Chiefs Col. Patrick D. Mulcahy and the late Lt. Col. Francis S. Kelly, and by Maj. General Edmund Sebree, USA Ret.

Dr. Francis H. Palmer was Director of Research of the U.S. Army Leadership Human Research Unit during the planning and early work of Task ENDORSE.

FOREWORD

Task ENDORSE began in 1956 at a time when interest in the effects of sensory deprivation was high. The coercive aspects of confinement of prisoners of war in a world of drastically limited sensory experience and social isolation led to interest in the research problem by the Assistant Chief of Staff, Intelligence, Department of the Army. At the same time, since the fundamental problem is that of the effects of monotonous surroundings, findings could be expected to have broad implications for other areas of military interest as well.

The research task proposed at that time was subject to close scrutiny because of the concern that the experimental conditions might have harmful effects on subjects, and because the laboratory approach it represented was unique within the usual scope of HumRRO research activities. Various possibilities for conducting such an investigation were explored, seeking profitable means for studying this seemingly potent environmental condition, and permission was obtained to tackle the first problem—the safety aspect. A pilot study, using staff experimenters themselves as subjects and utilizing crudely constructed devices and methods for limiting sensory experience, demonstrated the feasibility of the project, at least with regard to safety from severe physical and mental hazards to the subjects.

After the pilot study, considerable time was devoted to extensive planning as to the type of laboratory needed to conduct the research, and to cautious study of the implications of establishing such a laboratory and the research approach implied. In view of the need for research in this problem area and for the information that would be made available through the research as designed, HumRRO and the Office of the Chief of Research and Development, Department of the Army, agreed to go ahead with the project.

Today, Task ENDORSE facilities and procedures offer what is, to my knowledge, the most comprehensive means available in this country for studying a limited sensory and social environment. This progress report represents the first fruits to come from our studies.

Contents of this report are, with slight adaptation, those of a progress briefing presented to the Assistant Chief of Staff, Intelligence and other military personnel on 20 July 1960. Data were presented from experiments beginning in November 1959, in which special dark, quiet cubicles were used as a means of effecting the isolated confinement of troop volunteers in a limited sensory environment.

The report is divided into two parts, a general summary of research progress and a more detailed review of the procedures and results.

Howard H. McFann
Director of Research

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**PROGRESS REPORT ON STUDIES
OF SENSORY DEPRIVATION**

Part I—GENERAL SUMMARY

RESEARCH PROBLEM

Formally stated, HumRRO Task ENDORSE is a research project concerned with the effects upon human behavior of sustained confinement in a limited sensory environment. This confinement entails social isolation—solitude or lack of human companionship—as an important research ingredient. A critical aspect of the current study is the character of the sensory environment, with its lack of the customary sensory cues (sights, sounds, smells, and movement) and its complete monotony. Monotony is, indeed, the crux of the special environment under study.

This report is a summary of the research progress to date in this Task. It includes a general statement of the history of the project, a description of the unique laboratory facility and of the basic nature of the experiments, the findings so far, and an indication of the direction the research is expected to take in the future.

HumRRO Task ENDORSE is a pioneer research task within the human factors research program of the Department of the Army and is sponsored by the Assistant Chief of Staff, Intelligence and by the Office of the Chief of Research and Development. It derived from a requirement to support research concerned with methods of implementing the Code of Conduct. An analysis of the treatment of prisoners of war during the Korean conflict and publication of pioneer studies of a limited sensory environment were the principal influences leading to HumRRO's present focus on the study of the effects of isolation and sensory deprivation.

BACKGROUND AND TASK PLANNING

Initially, materials about the exploited prisoner of war were studied to determine in which area the most useful research contributions could be made. Researchers examined interview materials from Operation BIGSWITCH and summary materials from other sources, and conferred with officers at the Department of the Army. A number of administrative and research courses of action suggested themselves. An important action had already been undertaken by the Assistant Chief of Staff, Intelligence—publication of a summary pamphlet telling what the Chinese Communists did and did not do to American prisoners of war. This information has since been widely distributed, dispelling many misconceptions.

The Task staff then began to consider more specific research possibilities within the problem area. Concurrent with this planning, some unusual research reports from McGill University began to

receive—overnight—a wide audience. Professor Hebb and his associates had experimentally examined a deceptively innocent aspect of confinement experience; namely, the monotony of sensory experience in otherwise comfortable surroundings. Their subjects were paid to do nothing. Each student, for as long as he was willing, was paid \$20 per day to lie on a cot. He wore frosted goggles, heard nothing except the noise of a ventilation fan, and wore cardboard cuffs extending beyond his fingertips; he was physically comfortable and was fed upon request. The results were startling. Subjects were unwilling to remain in the experiment; they demonstrated impaired intellectual efficiency, both during and immediately after experimental confinement; they desired auditory stimulation, even in normally uninteresting forms; they experienced vivid visual experiences or hallucinations; and, finally, they had an increased susceptibility to propaganda.

Although it was already recognized that solitary confinement is a feared coercive device which produces apparent behavioral changes in the PW setting, few researchers in this subject area were prepared for the tentative findings of the McGill study in which the environment was safe and comfortable, and the confinement voluntary.

Task ENDORSE has followed the general methods of the Canadian work. Using themselves as guinea pigs, the research staff tried a number of ways of defining limited sensory environment. In using the McGill technique of frosted goggles and a masking noise, they experienced eyestrain and discomfort. This was undesirable because it produced annoying distractions interfering with what they sought to study; what was wanted was a comfortable monotony.

The next step was a pilot study conducted in improvised office cubicles with researchers, as subjects, spending four days in dark solitude. The results of the pilot study explorations were summarized in a progress briefing to representatives of the Assistant Chief of Staff, Intelligence.

Essentially, the conclusion was that, with suitable precautions, similar experiments involving sensory deprivation and isolation could be conducted with little risk of causing enduring harm to human subjects. The Surgeon General's Office has taken the position that there exists no undue hazard to the subject in such research.

PROCEDURE

Isolation Cubicles

To achieve the condition of a comfortable, silent, pitch-dark isolation, permission and funds were granted for the construction of a unique laboratory of eight special cubicles at the Presidio of Monterey, Calif. The cubicles were built within the existing walls of an abandoned cold-storage building, utilizing a compound wall structure of conventional building materials. At moderate cost, soundproofing was achieved which blocks out nearly all sounds. Here the subject is confined in complete darkness.

The cubicles are physically comfortable. They are approximately 7 x 9 feet in size, and equipped with a foam rubber bed, a refrigerator, and a chemical toilet. Air conditioning supplies fresh air at a constant 72°.

Figure 1 shows the building which was fortunately available as a site for the cubicle laboratory. Its existing thick refrigerator wall helped in the soundproofing of the cubicles.

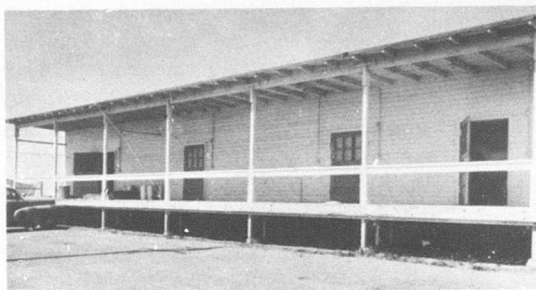
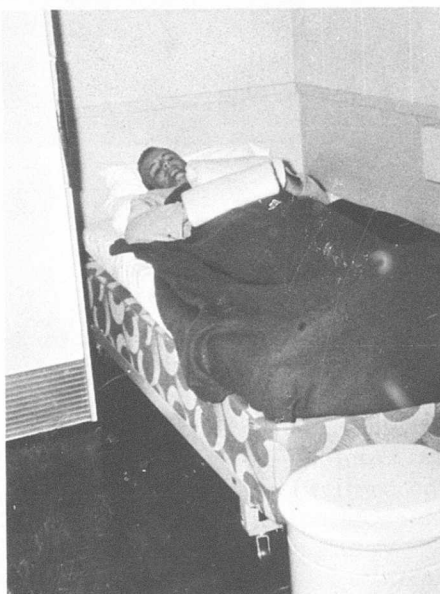
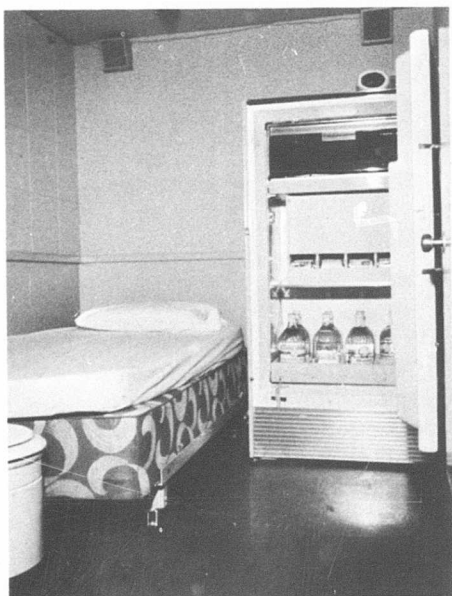


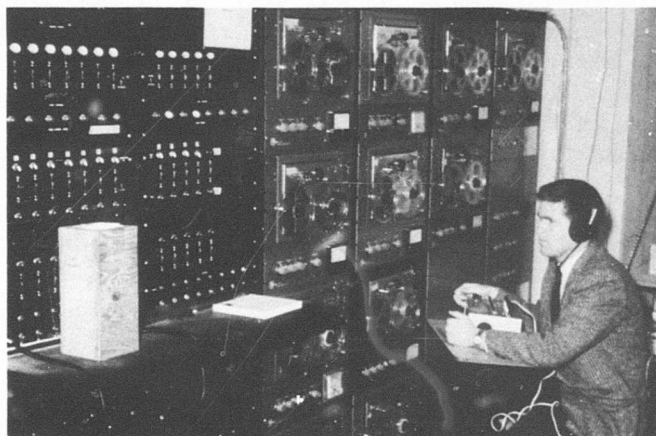
Figure 2 shows the interior of a cubicle. Its limited floor space is almost covered by the bed, refrigerator, and chemical toilet. Inside the refrigerator is a hamper which dispenses a special canned liquid diet, one can at a time, and, below that, bottles of spring water. The duct above the refrigerator supplies the conditioned fresh air. The microphones used to monitor the cubicle cannot be seen, but on the far wall are the two speakers which can be used to communicate with the subject from the control room.

Figure 3 shows a subject in the cubicle. He wears loose hospital-type pajamas, and brings with him only blankets, a pillow, and a



toothbrush. He is denied his watch and, of necessity, any light-producing equipment, such as smoking gear. Shown near his face are the foam rubber embedded gloves he is asked to wear as much of the time as possible to muffle his sense of touch and thus reduce his sensory experience. It has been found that subjects usually spend most of their time on the bed, although they are free to move around and are left to their own devices for activities and diversions within the restrictions of their tiny world.

The safety of the subject is carefully monitored from the control room of the laboratory. Monitoring is done in shifts, so that 24-hour coverage continues throughout the time when subjects are in the cubicles. Figure 4 shows a monitor on duty. His job is to listen to the sounds from all eight cubicles, checking constantly to be sure that everything is as it should be, and to take action if a subject requests early release. He hears all eight of the cubicles at once through his earphones. By watching a panel of lights and meters he can tell which men are speaking, and by remote control he can isolate sounds from any particular cubicle. A permanent record is provided by tape recorders, which are wired so that sounds in the cubicles start the recording process.



Research Subjects

In view of the ever-present possibility of harmful incident, however remote, the Task staff conferred with the Surgeon General's Office and concurred in selection and safety procedures. The subjects are high-aptitude, medically and psychiatrically screened young men who have just completed Advanced Individual Training at Fort Ord, Calif. Those who participate in the experiment have volunteered, after being shown the cubicles and hearing the research described.

Volunteers are randomly assigned either to the experimental condition or to a control group which lives a rather normal Army life supervised by NCO's from the research group. Control subjects live in a

standard Army barracks at the Presidio of Monterey and perform general work details during duty hours, except for the times when they are taken to the laboratory for testing. This testing follows a schedule which parallels the testing of the cubicle subjects.

In order to assess experimental effects, there must be a means of comparing experimental and normal behaviors. The control group, serving as a baseline for comparison, is vitally necessary to the undertaking, as it removes mere speculation about what constitutes normal behavior in the areas under study. For example, initially experimenters were impressed by the cubicle subjects' time disorientation; one four-day cubicle occupant estimated a time passage of only 30 hours. This reaction intrigued the research team until they began questioning control subjects and found that, likely as not, they did not know what day it was or just how long they had been serving as controls and living in the Presidio barracks.

FINDINGS

Even after several years of widespread interest in this general research area, there is but a tiny kernel of hard experimental fact underlying voluminous verbalizations about the alleged effects of sensory deprivation. Reliable facts are needed. To provide these, the effects of this specially limited sensory environment upon behavior are now being assessed.

The program was begun with a series of shakedown runs between January and November 1959. Formal experimentation began in November 1959. Data in this report were gathered between that time and July 1960, from 120 volunteer Army subjects who have been isolated in the dark, quiet cubicles and from an equal number of control subjects. The researchers feel that they can now speak with some assurance about the effects of sensory deprivation, at least as they have defined it.

What has been found thus far?

In general, it can be said with conviction that the subjects do not enjoy the voluntary confinement—either in prospect, during the confinement, or in retrospect. About one-third of those to whom the experiment was frankly described elected not to volunteer for confinement. Of those who did volunteer, half were randomly assigned as cubicle subjects; of this number, 34 per cent withdrew before the end of the scheduled four-day period.

Among the major reasons cited by the subjects for withdrawing from confinement prematurely were restlessness, boredom, inability to sleep, slow passage of time, darkness "getting me," and loss of time orientation.

Retrospective reports were used to determine the characteristic reactions of cubicle subjects to their limited sensory environment, as contrasted with the control subjects who experienced four days in a relatively normal Army world. The cubicle subject frequently reported

having felt worried, depressed, disturbed, frightened, in danger, regretful, angry, and tense. In contrast, the control subject seldom reported any of these feelings. The cubicle subject had difficulty distinguishing between wakefulness and dreaming sleep, but the controls had no such trouble. Unusual thoughts and daydreams were common to the cubicle subjects, and dreams appeared to be particularly vivid and realistic; such experience was infrequent to the control subject.

The stressfulness of the experiment was evaluated by a self-rating technique applicable to both cubicle and control subjects. The results clearly showed that the cubicle subject found his confinement experience stressful. The control subject reported feeling much less stress during his control-group experience.

Reported visual experiences were studied both through tests and through retrospective reports. When asked to describe what they could actually see in front of their eyes during a 30-minute reporting period in which control as well as cubicle subjects were kept in darkness, both groups reported seeing flashes, shapes, patterns, and scenes. On this test, the cubicle subjects did not differ markedly from the controls. In contrast, on their retrospective reports of the entire 96-hour period, the cubicle subjects noted the occurrence of complex visual events considerably more frequently than did the control subjects. From these data it was concluded that the cubicle experience is characterized by the accumulation, over time, of normally occurring visual events. In some cases these repeatedly experienced visual events may be stressful.

Intellectual efficiency was also examined by both retrospective report and experimental test methods. In their retrospective reports, cubicle subjects frequently mentioned having "run out of things to think about," having had impaired ability to concentrate and difficulty in memory, and having had jumbled and uncontrollable thoughts. Control subjects, on the other hand, rarely reported having experienced such inefficiencies of thought. Moreover, a series of intellectual efficiency tests, given after the subjects had been confined several days, tended to score the subjects in the cubicles as less efficient than control subjects. Post-confinement test data indicate that such reduced efficiency of cubicle subjects does not persist.

Finally, the reactions to social pressure were studied to determine whether the cubicle subject would be influenced more than the control subject by the judgments of a group. This test was an attempt to measure the degree to which the subject's opinion was swayed by knowledge of the judgments of a group of what he thought were fellow subjects. On this test a substantial tendency to conformity was found among all subjects, but the cubicle subjects, as compared to control subjects, demonstrated only a slightly greater tendency to conform to group judgments.

In summary: The soldier volunteers confined to a comfortable isolation in a limited sensory environment reported a number of experiences that were only rarely reported by their counterparts in a control group leading a fairly normal Army life. Cubicle subjects found themselves to be stressed, bored, restless, and troubled by vague physical symptoms. They were worried, frightened, tense, and confused as to the boundaries between sleeping and waking or fantasy and reality while

they were confined. In contrast, control subjects did not report having had these experiences. Cubicle subjects reported a preponderance of visual experiences and exhibited inefficiency of thought, as compared to controls. No clear-cut differences were found, however, in the susceptibility of cubicle and control subjects to pressure toward group conformity.

The researchers concluded that the experience of a drastically limited sensory environment in otherwise comfortable surroundings can be a formidable one. The effects seem to be closely linked to, if not entirely limited to, being in the monotonous environment; the evidence has been that effects dissipated within a few hours. There has been no psychiatric incident.

DIRECTION OF FUTURE RESEARCH

It should be mentioned that, as far as the research staff knows, the Army is sponsoring the only extensive systematic experiments designed to determine the potency of monotonous surroundings, as such. Ordinarily research in this area seeks more effective ways of coping with some particular environment. Only rarely does such research ask the general question, "How does reduced sensory stimulation affect behavior?"

In planning future research activity, the Task staff feels encouraged to pursue the assessment of the impact of the limited sensory environment provided by a dark, quiet cubicle. Assessment objectives will be, in part, an examination of the individual's ability to solve complex problems, to learn, to maintain alertness and vigilance, to observe, to communicate, and to maintain independence of judgment. Some of these assessments are already well under way, yet much remains to be learned. Also of interest would be an analysis of the interaction between a dearth of sensory experience and a sudden return to a normal sensory environment, for clues that may be of manipulative importance.

The ultimate goal of the research is to determine the precise nature of man's dependence upon the world of changing sensation and information. With knowledge of man's fundamental relation to his sensory environment at hand, the means and techniques of control should follow, as should methods for maximizing or minimizing these effects upon behavior.

Part II--DETAILED REVIEW

RESEARCH PROCEDURES

To assess the effects of confinement under conditions of reduced stimulation, numerous techniques were used to compare the behavior of cubicle subjects with the behavior of control subjects. Because of the vital importance of both cubicle and control groups to the research, an attempt will be made to contrast the roles and life conditions of the groups in discussing the procedures.

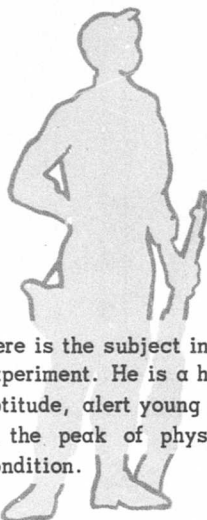
Subjects who volunteered for the confinement experiment were not necessarily placed in the cubicles; strictly on a chance basis, one half of the volunteers were assigned to the cubicle group, and the other half were assigned to the control group. Control subjects led a nearly normal Army life outside the cubicles under the supervision of an NCO from the research group. Subjects who did not volunteer were administered part of the test battery and were maintained in the barracks area under the control of the research group for the duration of the experimental period, under conditions similar to those for the control subjects.

A preview comment might be made as to the generic types of tests used. Pre-confinement tests were given to all subjects, before any of them were chosen for the cubicle experience. Intrusion, or during-confinement, tests were given to cubicle subjects while they were confined and to control subjects in cubicle-like rooms on a parallel time schedule. The intrusion tests afforded the principal means of comparing the effects of prolonged confinement with those of normal activity on the several behavioral criteria. Finally, post-confinement tests were given to both cubicle and control subjects as follow-up indicators of the effects of confinement.

On the following pages the experimental procedures are described both in words and in pictures which illustrate the life of the subject. The photographs show him from the time he is assigned to the U.S. Army Leadership Human Research Unit until he departs from the Unit after a busy week of uncommon experience.

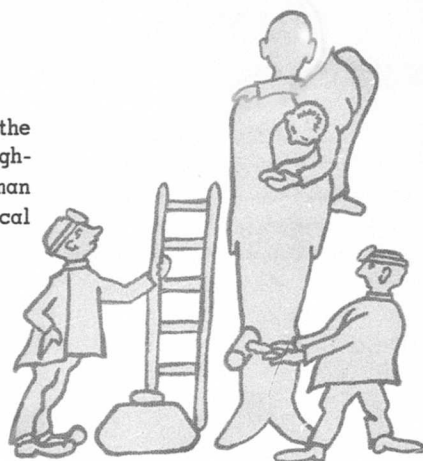
RESULTS

Now let us see how the men involved in the experiments reacted to the experience, either as cubicle subjects or as controls in a relatively normal Army existence. Much of the information in the first section below is based upon interviews with the subjects and upon questionnaire data. It should be considered as descriptive of the volunteering and cubicle experience. In subsequent sections, data more specifically directed toward evaluating the effects of a limited sensory environment will be presented by contrasting the experience of cubicle and control subjects. Also, the reactions of cubicle subjects will be compared more explicitly with the reactions of subjects living in a more normal sensory environment.



Here is the subject in the experiment. He is a high-aptitude, alert young man in the peak of physical condition.

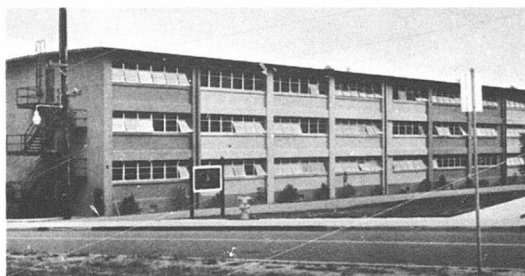
In keeping with safety procedures recommended by the Surgeon General's Office, he has been medically screened at the Fort Ord Station Hospital for obvious physical ailments which might rule him out as a cubical subject.



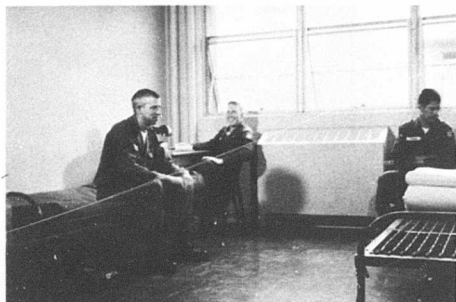
He has also been psychiatrically screened; anyone with, for example, a psychiatric history has been eliminated.



On the day of his graduation from Advanced Individual Training, he is placed on orders and brought to the Presidio of Monterey, where he is met by a sergeant from the research group.



He is billeted in a modern company-sized barracks at the Army Language School.



In a two-man room, he is provided privacy and comfort.

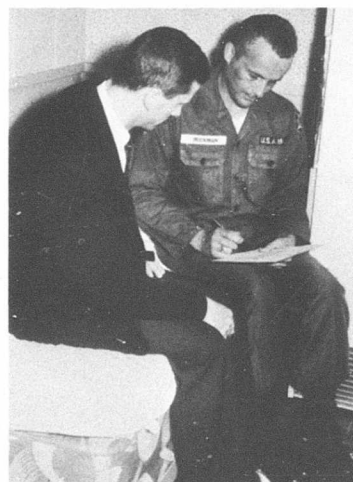


The next morning, he comes to the Leadership Unit to begin the research. The experiment is described to him in complete detail.

The first step is the initial orientation. He is told that his participation is purely voluntary and, if need be, he can withdraw from the cubicle at any time.

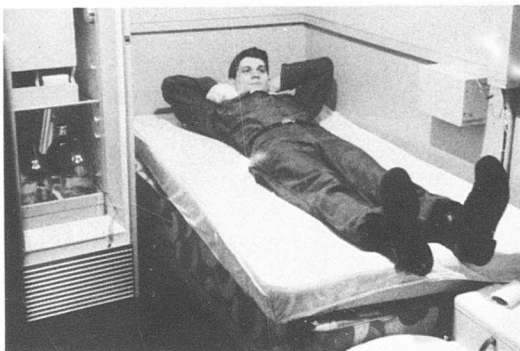
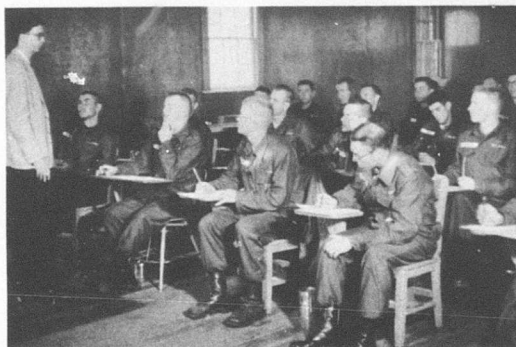


He is shown the cubicle in detail. Here the bottled spring water is being shown.



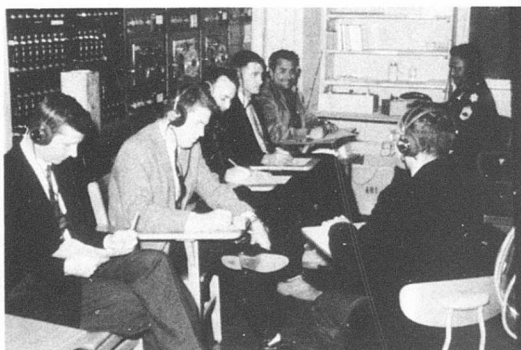
Next, each man is placed in a separate cubicle for a private interview concerning whether he does or does not wish to volunteer for the confinement experiment.

The remainder of the day is filled with pre-confinement testing. Here the men are taking paper-and-pencil tests giving background and personality data.



The men are also taken back to the cubicles for several types of individual tests.

From the control room, subjects are scored on a test in which the subject signals his answers by pulling a lever.



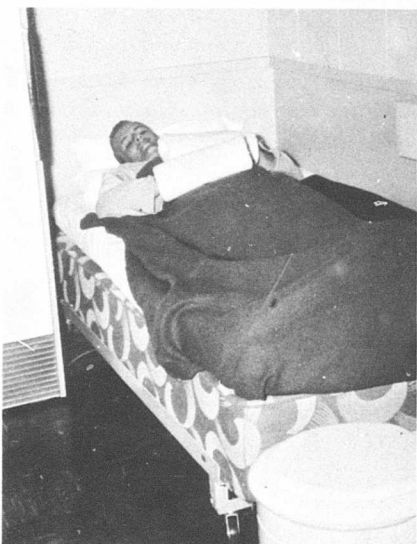
Other tests are given in which the man speaks his answers, and here researchers literally "lend their ears" to score them.

On the following morning, half of the volunteers are chosen for the cubicle group by a chance selection procedure.

The Cubicle Subject



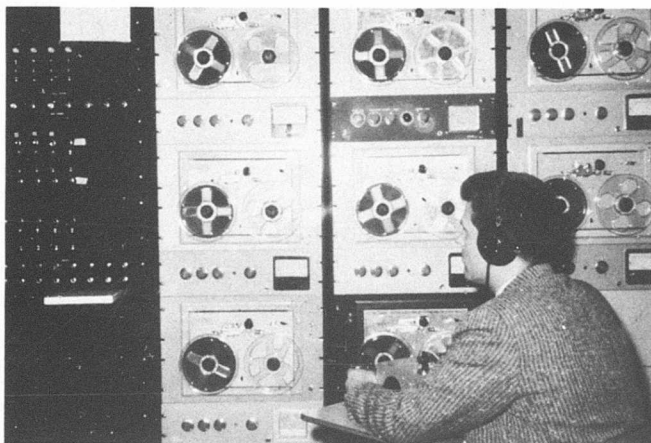
Once he has been selected to be a cubicle subject, the volunteer reports to the laboratory where he is outfitted with pajamas.



The men go into a cubicle for a detailed review of the facilities and operating procedures.

Then each man goes into his own cubicle and beds down, and the lights go out.

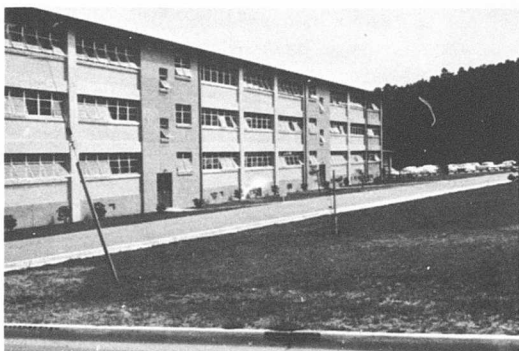
Safety monitoring from the control room begins, and continues 24 hours a day until the last man is brought out of the cubicles.



With the cubicle subject safely settled into his temporary quarters, let us look for a moment at the control subject. His life takes a very different turn.

The Control Subject

He is taken to the cubicle building and debriefed. He is informed that he was *not* among those chosen by chance for cubicle confinement.

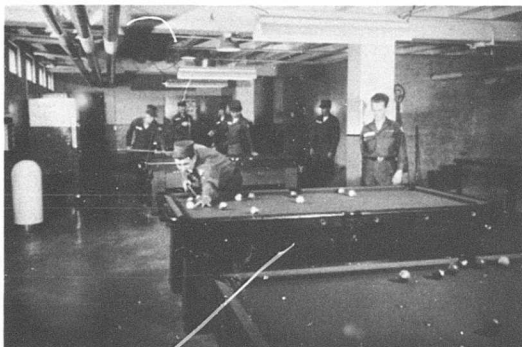


As he knows, he will remain in the barracks area except for testing periods at the Leadership Unit.



He eats his meals in this pleasant mess hall.

Although he is confined to the post for the duration of the experiment, he has freedom of movement to the PX, library, and movie during his off-duty hours. This is the day room.



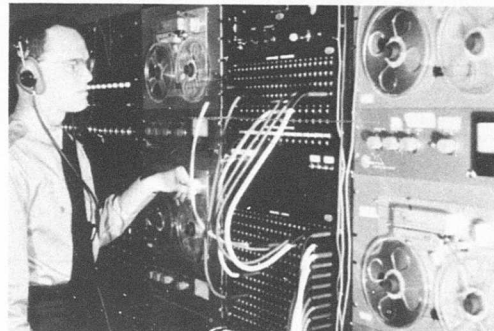


During duty hours he is put on general work details.



He is tested in a cubicle-like room on the same intrusion test schedule as the cubicle subject.

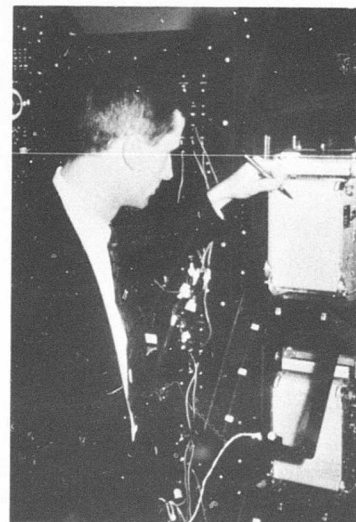
The test might involve having him solve problems or make reports which are monitored and tape-recorded.



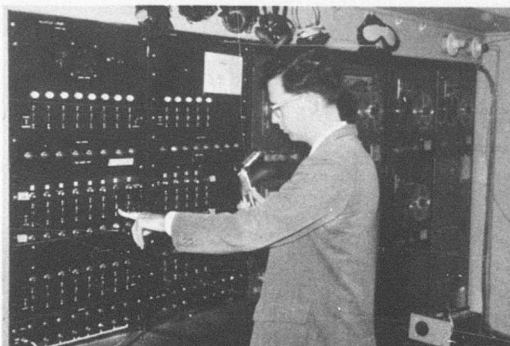
The Cubicle Subject

Back to the cubicle subject in his dark, quiet room

There is a continuous flow of data from the cubicles into the control room telling about the activities and eating habits of the subject.



At the end of the 96-hour period, the cubicle subject is told that the time is up. This starts the exit procedure, which is the same whether the subject has requested early release or has stayed the full four days.



An interviewer goes into the cubicle with a flashlight to adapt the man's eyes gradually to the lighted world.

Before he leaves the cubicle, he takes some of the post-confinement tests. The control subject is also brought to the laboratory and placed in a vacant cubicle for the same tests.



Next, the cubicle subject is given hot food. Even a TV dinner tastes good to a subject who has gone without hot food for four days.



He is returned to his barracks so that he can shower and shave before participating with the other cubicle subjects in a group interview. This meeting gives the subjects a chance to "rehash" and compare their experiences.

A high point of the week is the ceremony at which the Unit Military Chief presents a letter of appreciation to each cubicle subject.



The last research contact with the subjects is the final debriefing. Here deferred questions are answered, the experiment discussed, and mailing addresses obtained so that the subjects can be informed later about the research findings coming from their participation. Subjects then go on a well-earned three-day pass, and the cycle is complete.

Description

Volunteering and Selection

About 70 per cent of the men to whom the research was described volunteered for this experiment even though they profited, in the usual meaning of the word, very little by the volunteering act. Subjects volunteered for a variety of reasons. The two most frequently given were that (1) they wanted to contribute to scientific effort, and (2) they wanted to see how they would react. Many looked upon staying in a dark quiet room as a challenge to their ability to endure a stressful situation. Others said that they wanted to use the time to think out personal problems or to plan for the future. Still others indicated that it would be a good time to catch up on their sleep after the rigors of Advanced Individual Training.

A substantial number of the men who did not volunteer gave as their reason that they were afraid they could not last the full time and would thus fail the experimenters and themselves. Among other reasons given for not volunteering were more specific statements such as they "just couldn't stand being penned up," or were afraid of the dark, or were just too jittery and restless to undergo confinement.

Among the volunteers, selection to go into the cubicles was regarded as a mixed blessing. Most of the cubicle subjects were pleased that they had been picked, but a number indicated concern over the anticipated stress. The control subjects, when notified of their role, presented a picture of mixed disappointment and relief. Many of the controls had made careful plans for the role of cubicle subject and thus felt let down; at the same time, their preparations for the experience had led them to feel concern about how they would react. Their selection for the role of control subject relieved these anxieties.

The Cubicle Experience

Immediately prior to entering the cubicles, the subjects were again briefed, in groups of four, as to the contents and facilities of the cubicles. Although the researchers tried to make these sessions relaxed by bringing along a coffee pot and conversing casually, the sessions were notably tense. Most subjects seemed guarded in commenting about their anticipated reactions to spending time in the cubicles. Most of them had prepared by planning activities such as exercising, or mentally listing topics to think about; others prepared by trying to stay awake all the previous night. After this briefing the subjects entered the cubicles.

During their stay in the cubicles, a substantial majority of the subjects talked very little. Since many of them had previously asked if they might talk and describe their experiences, the low productivity was surprising. When they were asked about this later, many commented that they felt foolish carrying on a one-way conversation, or that they were reluctant to talk even about innocuous details. Others said that they did not want to reveal too much about themselves.

The subjects spent most of their time on the bed. Although almost all of the subjects reported boredom and the slow passage of time as important aspects of the experience, relatively few actually carried to completion their plans to use physical activities to help pass the time. They reported having had great difficulty in carrying plans into action, although they fidgeted, squirmed, and experienced considerable restlessness.

A great deal of the time in the cubicles was spent in both thinking and dreaming about the past. For some subjects these memories and dreams were pleasant and helped to pass the time. Many subjects, however, found that unpleasant, frightening, and strange thoughts occupied these periods and, worse, that they were unable to stop these thoughts. Some subjects became fearful that something terrible might happen to them—that they might be adversely affected by the experience. Others were bothered because they could clearly picture in front of them the things they were thinking about. Still others reported being unable to distinguish wakefulness from sleep, feeling that the room was closing in on them, or feeling that their bodies seemed different from normal. Some subjects were convinced that pictures had been flashed on the walls of the cubicles, and others reported that they had thought someone was hiding in the room.

Subjects ate less food than they wanted but not necessarily because the food was unpalatable. They simply did not want to eat even when they felt hungry. The reduced food intake resulted in a minor weight loss for most subjects, although a few consumed large quantities of food and actually gained weight. Interestingly enough, very few subjects reported that they missed smoking, even though many had been concerned about this prior to entering the cubicles.

Over one-third of the subjects requested release prior to the end of the four-day period. In many cases, the decision to leave was based on the frequent occurrence of many of the factors discussed above. For many of them, extreme restlessness, tenseness, nervousness, persistence of unpleasant thoughts, inability to sleep, and intense boredom were major factors.

Upon leaving the cubicles many subjects felt light-headed, unsteady on their feet, and dizzy. Most subjects found the lights to be brighter, colors sharper, and their auditory world crowded with sound. Some had trouble with eye-hand coordination, and many were a little unsure in carrying out normal physical activities.

These effects dissipated within 24 hours. However, during these first 24 hours, some subjects found themselves irritated by the loudness of sound, had difficulty carrying on social conversation, and, although they wanted companionship, also sought periods of solitude. Sleeping and eating habits were also mildly disorganized for some subjects during this period.

Many subjects found themselves hard pressed to describe accurately what the cubicle experience was like. This may have been due, in part, to the problem of explaining why four days of lying on a foam rubber mattress in an air-conditioned room should be difficult. To provide a comparison, many cubicle subjects were asked to make a

choice between the hypothetical alternatives of spending additional days in the cubicles or a comparable number of days during the most stressful part of basic training. Few cubicle subjects indicated they would have chosen to again sample the limited sensory environment. Nearly all, however, were pleased at having completed a difficult and stressful task.

Questionnaire Results

The descriptive material just reported impressed the research staff with the evident stress produced by the limited sensory environment. However, since many of these evidences of stress, such as worry, fright, and so on, could also occur outside the cubicles, some means was needed for contrasting the relative frequency with which these effects occurred in cubicle and control groups. To obtain this information in a standard manner, a questionnaire was prepared with several hundred items regarding the reportedly stressful effects of the cubicle condition. The items were worded so as to be equally applicable to normal living experiences outside the cubicles. Immediately following a man's exit from a cubicle, the cubicle subject and a control were asked to complete the questionnaire. The cubicle subject answered the questions with respect to the time he spent in the cubicle; the control subject, with respect to the corresponding time also spent at the Presidio, but not in a cubicle.

To aid in the presentation of large amounts of questionnaire material, the items have been grouped according to their content areas.

The first group of items referred to matters of worry, fright, and oppression. Sample items from this section were as follows:

"I had to assure myself that I was all right."

"I felt I was in danger."

On items of this type the cubicle subjects answered in the affirmative direction a substantially greater number of times than did the controls, suggesting that worry, concern, and tension were more characteristic of the experience of cubicle subjects than of control subjects.

Another set of items was directed toward the quality of the subject's dreams and daydreams, as well as his reactions to his surroundings.

The following items were among those included in this area:

"I had dreams that were strikingly vivid."

"I had dreams that continued after I woke up."

"I was not sure whether I was awake, or asleep and dreaming."

"My surroundings seemed changed though I knew they weren't."

"I had very strange daydreams."

On such items the cubicle subjects, more frequently than the controls, indicated the marked realism and vividness of their dream experiences, as well as the strange and unusual qualities of their waking experiences.

The passage of time was the topic of another set of items, typified by the following:

"Time seemed to stand still."

"I became upset because I could not tell what time it was."

The passage of time and knowledge about time were of much greater concern to the cubicle subjects than to the controls.

The cubicle subjects answered in the affirmative direction far more frequently than the control subjects on items having to do with discomfort, physical symptoms, and restlessness. Sample items from this section are as follows:

"I started to sweat for no reason at all."

"I could not rest comfortably because of annoying sensations in my body."

In addition to these content areas, results on other items covering speech and speech difficulties, clarity of memories, lonesomeness and isolation, intensity of sexual feelings, and hunger indicated that the cubicle subjects evaluated these experiences as being more frequent and/or more stressful than was the case for the controls.

In summary, then, a questionnaire of many items thought to be relevant to the reported stresses of a limited sensory environment was answered by both cubicle and control subjects with regard to their respective living conditions. The cubicle subjects reported substantially greater frequencies of worry, fear, strange experiences, persistent and vivid dreams, restlessness, physical discomfort, concern over the passage of time, lonesomeness, and speech difficulties, than did the control group.

Subjective Stress Scale Ratings

During these early stages of the research, extensive reliance has been placed on the subject's ability to describe the effects of the experimental conditions. Although there may be many effects which the subject is unable to evaluate and, in fact, some of which he may be unaware, the subjects' retrospective reports have been found to be of considerable value in indicating the extent to which a limited sensory environment is stressful.

The Subjective Stress Scale (SSS) is one of the self-report measures used. This test was developed in another HumRRO Task-Task FIGHTER—and has been found to be a useful method of assaying the stress of simulated emergency situations. In this test the subject is asked to circle the one out of 15 descriptive words or phrases that best describes how he felt at a given time. A score can be assigned to each of the 15 adjectives or phrases.

The SSS was administered to both cubicle and control subjects approximately one hour after the termination of the experiment. Three ratings were obtained from each subject with respect to the following points in time:

1. "Circle the word or phrase which best describes how you felt before you knew you were coming to the Presidio of Monterey for a week."
2. "Circle the word or phrase which best describes how you felt while in the cubicles." (The control subjects were asked how they felt while living at the Presidio of Monterey.)
3. "Circle the word or phrase which best describes how you feel right now."

On the first, or baseline, rating (how they felt under the normal stress of Army life prior to their arrival at the Presidio), cubicle and control subjects reported similar levels of stress.

On the second rating, the stress the cubicle subjects reported experiencing during the confinement phase was markedly greater than that indicated on their own baseline scores. In contrast, the control subjects' scores with respect to living at the Presidio were even lower than their baseline scores.

On the third rating, in which both groups of subjects indicated how they felt at a time shortly after termination of the confinement phase, cubicle subjects reported slightly greater stress, and control subjects less stress, than on their respective baselines. Even though the stress reported by the cubicle subjects shortly after confinement was considerably less than the stress they reported during confinement, the level of reported stress continued to be sizably greater than the stress reported by the controls.

In summary, then, it appears from this self-report technique that, although cubicle and control subjects had similar baseline ratings of stress, the cubicle subjects descriptively rated themselves as being under greater stress both while in the cubicles and shortly after leaving the cubicles than was the case for the control subjects at the same points in time.

Reported Visual Sensations

Previous experimental studies and autobiographical materials describing the effects of sensory deprivation have reported that visual experiences of striking vividness and complexity occurred relatively often. Although these visual sensations could not be explained in terms of external light sources, they were so compelling that many individuals reportedly had difficulty in deciding whether they were actually seeing something in front of their eyes.

In the literature dealing with the effects of sensory deprivation, these visual phenomena have been viewed as one of the signs that sensory deprivation has a profound effect on the individual. Some authors describe these visual events as a type of hallucination and imply certain similarities between the effects of mental illness and sensory deprivation.

One of the initial studies of Task ENDORSE was to investigate experimentally the extent to which these visual phenomena occurred under the experimental conditions of the Task. In order to assess the reported visual sensations (RVS's), a measure reflecting the magnitude or complexity of the visual experiences was needed. In addition, it was necessary to compare the RVS's of control subjects who had been in the dark for a brief time with those of cubicle subjects who had spent a substantial time in the dark and quiet cubicles.

Two measures of RVS's were taken. The first measure (during-confinement RVS) was obtained after 72 hours of confinement. The control subjects were taken to the laboratory at the time of the test,

and all subjects were asked, while lying in the dark with their eyes open, to describe all of the visual sensations they could actually see in front of their eyes. They were carefully cautioned against reporting thoughts or memories they were only thinking about but not actually seeing. They were given 30 minutes in which to report, and all responses were tape-recorded.

RVS transcripts were then scored according to a standard procedure and assigned numbers representing the complexity of the RVS's. Under this scoring procedure, it was found that subjects could be reliably placed in one of five categories, each represented with score values as follows:

Score	RVS
0	None
1	Vague, diffuse light
2	Geometrical shapes or forms
3	Single objects
4	Complex objects or scenes

It was also found, with a high degree of consistency, that if a subject reported visual sensations of greater complexity, he reported all of the sensations of lesser complexity as well. Therefore, each subject was assigned a single score based on the value of the most complex RVS he reported.

The second measure (post-confinement RVS) was obtained after the experimental confinement was over. All subjects completed a questionnaire which contained, among other items, questions designed to parallel the levels of complexity of RVS's reported above. Subjects were assigned to one of five categories with score values as follows:

Score	RVS
0	Negative response to items referring to the occurrence of visual sensations.
1	Positive response to the item: "While I was in the dark I was aware of bright flashes of light in my eyes."
2	Positive response to the item: "In the dark I noticed various geometric shapes that seemed to float before my eyes."
3	Positive response to the item: "I saw objects which I knew were not there but looked real just the same."
4	Positive response to the item: "In the dark I seemed to see people and scenes which were not part of my thoughts or memories."

Each subject was assigned a single score based on the highest score value he received on the questionnaire items.

The mean score values for cubicle and control subjects on the during-confinement RVS measure (the test on which, for 30 minutes in the dark, subjects reported what they were actually seeing in front of them) indicated that the complexity of the RVS's reported by the cubicle group was only slightly greater than for the control group. It might be well to mention that, even when subjects were given a limited period of

time for reporting on-going visual sensations—in this case 30 minutes—visual sensations of considerable complexity were relatively common. In fact, 18 per cent of both cubicle and control subjects reported visual sensations falling in the category of greatest complexity. The subjects reported an average of five visual sensations during the 30 minutes.

The mean score values for cubicle and control subjects on the post-confinement RVS measure (the test on which the subjects were asked to answer items about visual sensations occurring throughout the entire period of the experiment) show that the cubicle subjects reported having experienced visual sensations of strikingly greater complexity than was the case for the control subjects. The complexity of the post-confinement RVS's for the cubicle subjects was substantially greater than their during-confinement RVS's, while for the control subjects the post-confinement RVS's were slightly less complex than their during-confinement RVS's.

Interview and questionnaire material suggests that the accumulation of frequently occurring visual sensations became stressful for many cubicle subjects—sufficiently so, in some cases, to result in the subjects' requesting release from the cubicles prior to the end of the experiment.

In summary, then, several days in a limited sensory environment, as contrasted with only a very brief period of darkness, did not noticeably increase the complexity or frequency of RVS's occurring within a 30-minute reporting period. However, subjects in prolonged dark isolation later reported having experienced substantially more complex RVS's than did controls living in a normal environment.

These results on visual experiences are interpreted as indicating that the important aspect of a limited sensory environment is that it provides the cubicle subjects with lengthy waking periods in the dark, during which time they repeatedly experience visual sensations that are essentially normal. The difference between the visual experiences of the cubicle and control subjects seems to be not in the quality of the RVS's, but in the cubicle subjects' greater opportunity to sample the wide variety of RVS's which normally occur. The accumulation of these visual experiences and their relative dominance over other waking activities may be the basis for the stressful and seemingly unusual visual experiences reported in the literature.

Intellectual Efficiency

A comparison of intellectual functioning has been made between cubicle and control subjects, utilizing both questionnaire and objective test materials.

Shortly after completion of his cubicle experience, each cubicle subject and his control separately completed a questionnaire which included several items dealing with intellectual efficiency. Each was asked to indicate the extent to which the item was representative of his experiences during the experiment. Examples of the items used are:

"I ran out of things to think about."

"I found it difficult to remember clearly what I was thinking about only a short time earlier."

"My ability to concentrate was worse than usual."

"I was not able to control my thoughts."

"I became confused because too many thoughts tumbled in one after another."

"My thoughts were jumbled."

On nearly all of the items in the questionnaire dealing with efficiency of intellectual functioning, there were striking differences between cubicle and control subjects. The direction of the differences indicates that cubicle subjects experienced what appear to be considerable decrements in intellectual efficiency during their stay in the cubicles.

A battery of five intellectual efficiency tests was administered, first as a pre-confinement test, later as an intrusion test given approximately 75 hours after the beginning of the experiment, and finally as a post-confinement test. The tests, taken over the intercommunication system, were designed to evaluate certain primary mental abilities. They were adapted from, or were similar to, subtests in standard intelligence tests. The general areas included in the test battery were inductive reasoning, immediate memory, verbal fluency, numerical facility, and successive subtraction.

Comparisons were made between cubicle and control subjects in their performances on the intellectual efficiency battery. A single score was derived for each subject for each administration, to represent his performance on the entire test battery. Analysis of these scores indicates that the group confined in the cubicles tended to perform at a poorer level than did the control group at the same time.

In summary, then, both objective tests and questionnaire materials have been used to evaluate the intellectual efficiency of cubicle and control subjects. The questionnaire materials rather dramatically indicated that the cubicle subjects rated themselves as less able to use their intellectual abilities than did control subjects. The results of the objective test lend moderate support to the conclusion that men undergoing the cubicle experience are less efficient in intellectual pursuits than are the control subjects. When cubicle subjects were given the objective test battery shortly after leaving the cubicles, however, there was no evidence of any decrement in intellectual efficiency in comparison either with their pre-confinement achievement or with the controls.

Group Influence Test Results

Another way in which the effects of a limited sensory environment were evaluated was by measuring one aspect of the extent to which the attitudes and judgments of an individual can be influenced through social pressure, that is, by the judgments of other individuals or groups. The techniques in this investigation were borrowed extensively from standard techniques of laboratory experimentation. Laboratory techniques similar to those used by Asch, Crutchfield, and others, were used to determine whether cubicle subjects and control subjects would be affected to a different degree by the judgment of others.

The experiment required the subjects to make judgments on a series of multiple-choice problems. The problems involved the ability to count various series of brief tones that sounded like Morse code dots presented in rapid succession. For each problem the subject had to judge which one of three alternative tone groups was the correct answer.

A pre-confinement test was given to each subject to evaluate his ability to judge the correct answers and to familiarize him with the nature of the task.

After the third day of confinement, another test was given to the cubicle subjects and to their controls. This time the subject was led to believe that he was one of five men performing the task simultaneously in separate rooms. In contrast to the pre-confinement tests, where subjects performed the task without hearing the judgments of any other person, on this test the subject was told that he would be able to hear the judgments of the other four men taking the test with him. Each man was to give his answer in sequence when asked for it. Although no subject knew it, each of the other four voices he heard in the test was prerecorded.

Every subject was told that he was fourth in the reporting sequence. Thus, he heard the answers given by three of the recorded voices prior to, and one following, the stating of his own judgment. Since all subjects were assigned to position four, they were all exposed to the same possibilities for group influence.

On most of the problems, a majority of the recorded voices gave correct judgments, but on six of the 18 problems, the recorded voices agreed upon a wrong answer. This placed the subject in a position to be influenced by the judgment of the group which he assumed to be composed of his fellow subjects. If he went along with the group in giving a wrong answer, he was scored as having made an error.

Cubicle and control subjects who had made accurate judgments on the pre-confinement test were compared on their during-confinement error scores. Fifty-six per cent of these cubicle subjects and 48 per cent of these controls made an error on at least one of the six critical problems where the recorded voices had agreed upon a wrong answer. This difference between the two groups is too small to be considered of much consequence.

To summarize, in the group influence experiment, on relatively easy problem materials the judgments of all of the subjects were greatly influenced by the judgments of what they assumed to be a group of their fellow subjects. There was, however, no substantial difference between cubicle subjects and their controls in the amount of influence shown.

CONCLUSIONS AND FUTURE OBJECTIVES

On Task ENDORSE information is being sought, in a laboratory setting, about man's dependence upon a world of changing sensation and information. From the research to date, it is concluded that this seemingly innocuous and comfortable laboratory environment, which is characterized by a dearth of sensory events, is a stressful and

formidable experience. Intellectual efficiency is found to be temporarily impaired and visual sensations of a highly repetitive nature may be experienced. It is not known at this time whether the potent factors are the absence of the usual sensory experience, the social isolation, or perhaps other aspects of the situation.

The payoff from this research consists of experimental evidence contributing to an understanding of how men are affected by exposure to situations of this sort. Task ENDORSE plans embrace two major phases of research, each of which provides a somewhat different approach to the matter of utilization by the Army.

The first phase might be described as an effort to assess and to understand the effects of a limited environment. The assessment aspect of this phase, covered in part in this report, concerns itself with the effects of a limited environment upon a variety of skills. Future studies will include assessment of such skills as the individual's ability to maintain a vigilant, searching attitude when required to detect the occurrence of an infrequent auditory or visual event, to carry out efficiently actions based on verbally communicated instructions, and to communicate the occurrence of critical events accurately. Another aspect of this phase, investigated concurrently with the assessment studies, will be directed toward better understanding of how the limited environment exercises its effects upon human behavior. Researchers hope to gain from these studies a better understanding of how the experimental variable is related to other psychological concepts. They plan, for example, to investigate the extent to which a monotonous environment may provide an unusually potent setting, through the manipulation of sights and sounds, for influencing attitudes and judgments, or for increasing or decreasing the rate of learning.

The first phase is viewed as primarily directed toward a systematic investigation of the experimental variable per se, in the hope of learning some general principles concerning the effects of a limited environment. Much of the utilization of the results of this phase of the research may be in the form of an adaptation of the research findings by the sponsor to the particular operational environment to which the findings are pertinent.

The second phase of the research will be directed toward experimentally evaluating alternative methods of using the basic research information obtained in the first phase. For example, although it is not planned to simulate the captive conditions, there may be considerable interest in the extent to which various training treatments are effective in minimizing, or perhaps maximizing, the debilitating effects of a limited environment. The direction of the second phase will be dependent upon the findings of phase one, and upon the extent to which it is necessary to supplement the utilization procedures of phase one by the use of experimental research methods.

Thus, the current thinking of the research staff has led to a view of Task ENDORSE as a pioneer effort to obtain reliable research information about the effects of a limited environment. The Task is necessarily long-term. It is anticipated that this approach to the research problem will provide information for military implementation, both in the Intelligence field and in other military areas as well.